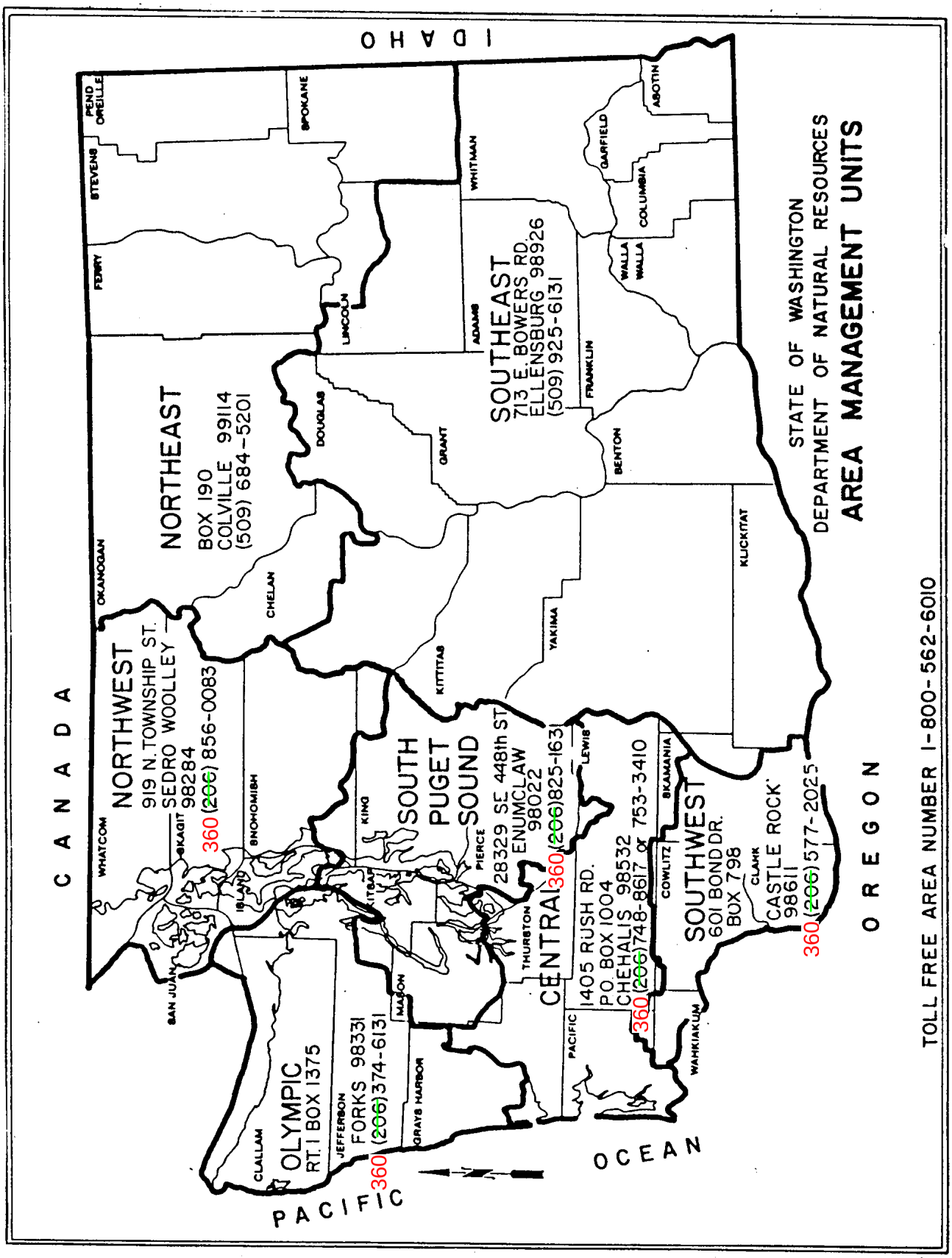
Permit Approval	Grantor	Conditions Requiring	When To Initiate	Who Applies	References
CZMA	DOE	Applicants for federal permit/license are required to certify that the activity will comply with the state's Coastal Zone Management program (Shoreline Management Act)	When applying for permit	District	CZMA Sec. 307 16 USC 145 RCW 90.58
NPDES	DOE	Discharge of pollutants into state surface waters	During design	District	WAC 173-220 FWPCA ^{S} 402 33 USC 1344 RCW 90.48.260
State Waste Disposal (Discharge)	DOE	Discharge of waste material from sand and gravel washing, pit dewatering, or cement/asphalt plant discharge into state waters	During design	District	RCW 90.48.160 WAC 173-220
Short-Term Modification	DOE (Regional)	Short-term activities which may result in temporary reduction of water quality standards and activities not subject to a waste discharge permit or water quality certification	During design	District	WAC 173-201-035(8)(e) WAC 173-201-035(5)(a) WAC 173-102-100(2)
Water Rights Appropriation	DOE	Appropriation of ground water or surface water	Prior to putting water to use	District or Contractor	RCW 90.44 RCW 90.03.250
Forest Practices Approval	DNR (Area Offices)	Public/private land capable of supporting merchantable timber — some activities — road construction, pits, pesticide use, hydraulic permits, shoreline permits, reforestation, etc.	Environmental document phase/prior to commencing	Contractor	WAC 222
Operating Permit for Surface Mining	DNR	Surface mining (pit and quarry sites) — more than 3 acres disturbed at one time or pit walls are more than 30 feet high and steeper than 1:1	After approval of the ultimate reclamation plan	HQ	RCW 78.44
Shoreline Management	Counties/Cities DOE	Shoreline development or construction valued at $2,500 or more, or materially interfering with normal public use of water. Development within 200 feet of water must be consistent with the local Shoreline Master Plan.	During preparation of environmental document	District	RCW 90.58 RCW 36.70
Temporary Air Pollution	Local Air Pollution Control Authority/DOE	Pollutants above allowed levels for temporary periods	Prior to work commencing	Contractor	RCW 70.94
New Source	DOE	Air pollution from point source (asphalt	Prior to work commencing	Contractor	RCW 70.94.152
Building	County/City	Construction of any building — value of materials over $500	Prior to work commencing	Contractor	RCW 36.21.080
Sewage Facilities	DOE/DSHS/County	Construction/modification of domestic/industrial wastewater facilities (sewer relocation, rest area construction...) DOE: greater than 14,500 gpd, surface water discharge, or a mechanical treatment process involvement. DSHS: 3.500 gpd to 14,500 gpd. County: less than 3,500 gpd.	Prior to work commencing	District/ Contractor	RCW 90.48.110 WAC 173-240

CFR — Code of Federal Regulations
CZMA — Coastal Zone Management Act
DNR — Department of Natural Resources
DOE — Department of Ecology
EO — Executive Order
EPA — Environmental Protection Agency
FERC — Federal Energy Regulatory Commission
FHWA — Federal Highway Administration
FWCA — Fish and Wildlife Coordination Act
FWPCA — Federal Water Pollution Control Act
NMFS — National Marine Fisheries Service (Dept. of Commerce)
NPDES — National Pollutant Discharge Elimination System
OAHP — Office of Archaeology and Historic Preservation
RCW — Revised Code of Washington
SDWA — Safe Drinking Water Act
USFWA — U. S. Fish & Wildlife Service (Dept. of Interior)
WAC — Washington Administration Code

Figure 240-1



DNR AREA MANAGEMENT UNITS

Figure 240-3

3. 30 % Development Stage

At the 30% stage, most of the important project decisions have been made and the opportunity to affect the project design is limited. The VE study focuses on constructibility, construction sequencing, staging, traffic control elements, and any significant design issues that have been identified during design development.

(d) Study Preparation

To initiate a VE study, the project manager submits a Request for Value Engineering Study form (shown in Figure 315-2) to the regional VE coordinator at leastone month before the proposed study date.

The regional VE coordinator then works with the state VE Manager to determine the team leader and team members.

The design team prepares a study package that includes project information for each of the team members. A list of potential items is shown in Figure 315-3.

The region provides a facility and the equipment for the study (Figure 315-3).

(e) Team Leader

The quality of the VE study is dependent on the skills of the VE team leader. This individual guides the team efforts and is responsible for its actions during the study. The best VE team leader is knowledgeable and proficient in transportation design and construction and in the VE study process for transportation projects.

For best results, the team leader should be certified by the Society of American Value Engineers (SAVE) as a Certified Value Specialist (CVS) or as a Value Methodology Practitioner (VMP).

Team leadership can be supplied from within the region or from other regions, OSC, consultants, or other qualified leaders outside the department. The state VE Manager coordinates with the regional VE coordinator to select the team leader. A statewide pool of qualified team leaders is maintained by the state VE Manager.

(f) Team Members

The VE team is usually composed of five to eight persons with diverse backgrounds that are relevant to the specific study. The team members may be selected from the regions, OSC, other state and federal agencies, local agencies, and the private sector.

The team members are selected on the basis of the kinds of expertise needed to address the major functional areas and critical high-cost issues of the study. All team members must be committed to the time required for the study. For best results, the team members have had VE training before participating in a VE study.

(g) VE Study Requirements

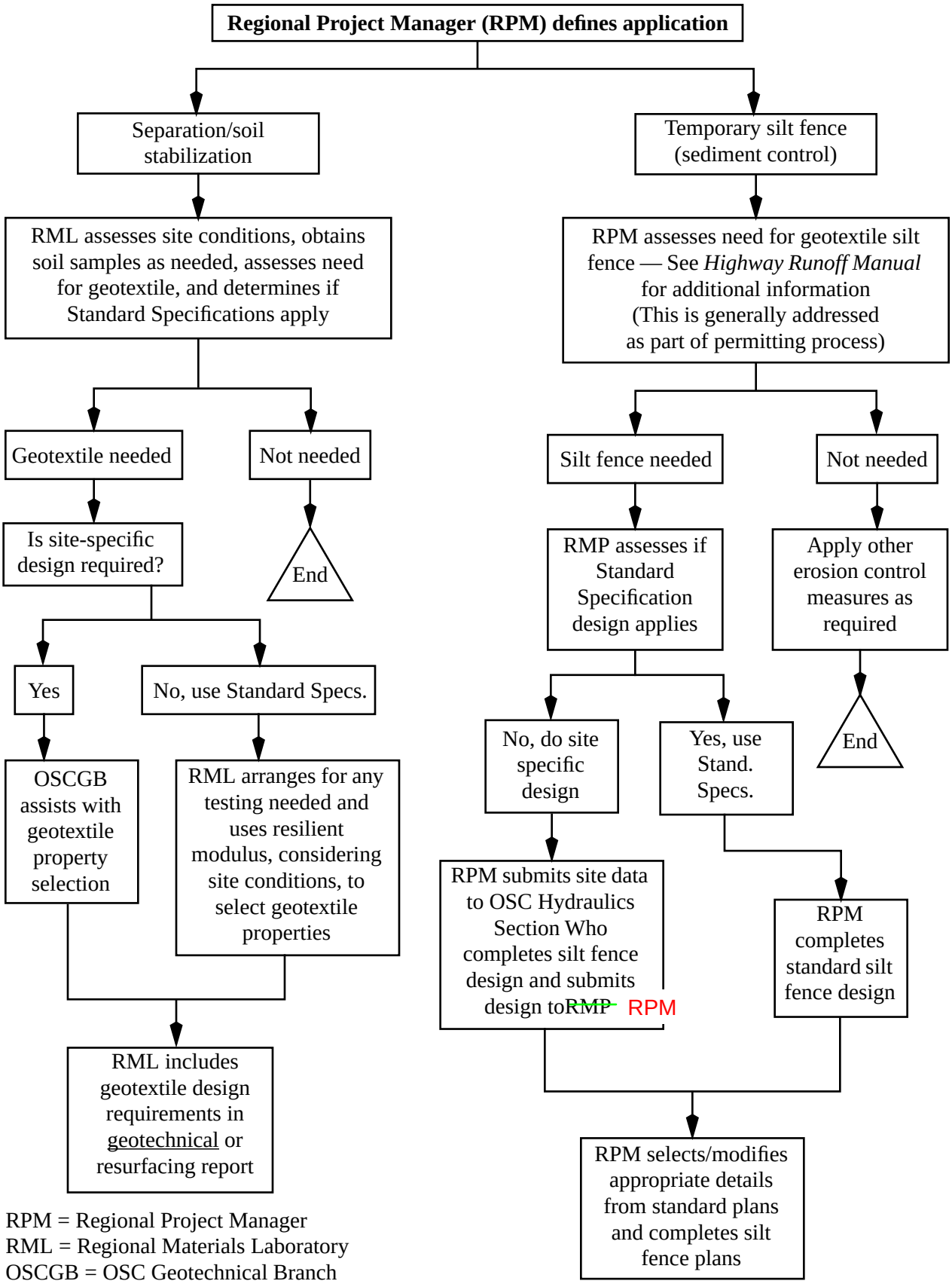
The time required to conduct a VE study varies with the complexity and size of the project, but typically ranges from three to five days.

The VE study Final Report and Workbook include a narrative description of project input information, background and history, constraints and drivers, VE team focus areas, and a discussion of the team speculation, evaluation, and recommendations. All of the team's evaluation documentation (including sketches, calculations, analysis, and rationale for recommendations) is included in the Workbook as part of the Final Report. The number of copies of the Final Report and Workbook is specified by the project manager.

(2) Implementation Phase

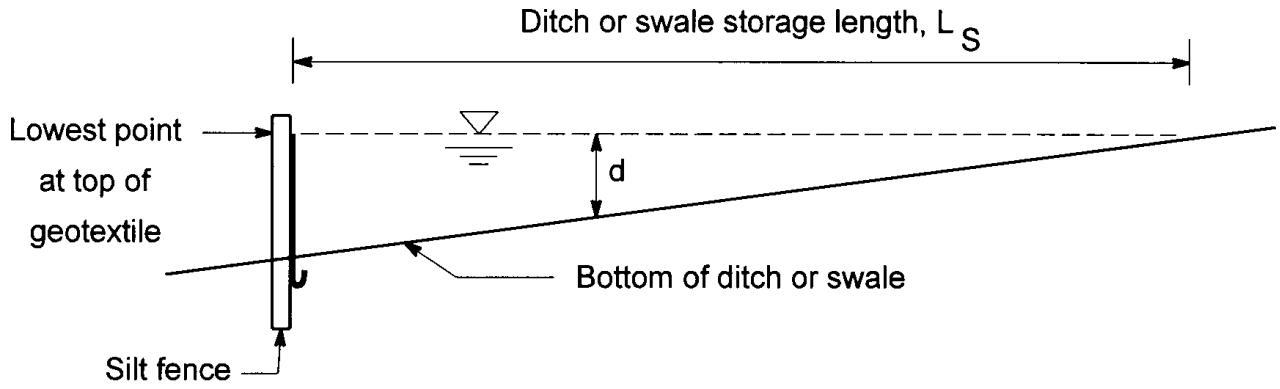
The VE team's recommendations are included in the Final Report and Workbook. The project manager reviews and evaluates the recommendations and prepare a VE Decision Document. This document has a specific response for each of the VE team recommendations and a summary statement containing the managers' decisions and schedule for implementation regarding further project development.

The VE Decision Document also includes estimated costs or savings of the recommendations as well as the estimated cost to implement the recommendations. A copy of this document is sent to the state VE Manager so the results can be included in the annual VE report to FHWA.

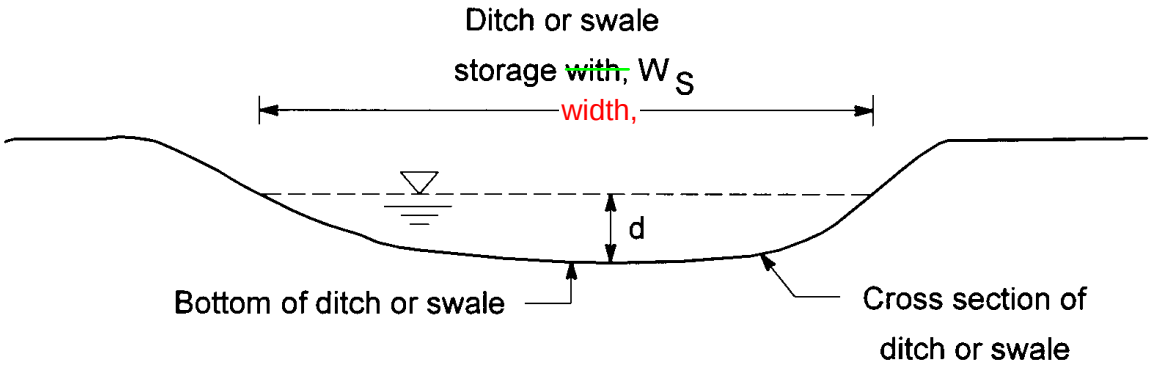


Design Process for Separation, Soil Stabilization, and Silt Fence

Figure 530-5

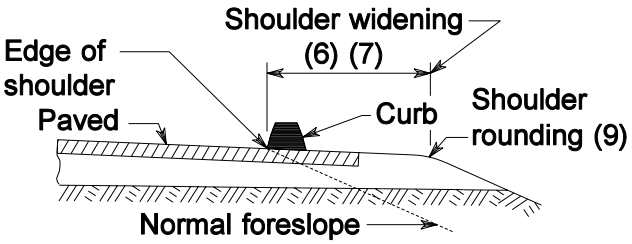


(a) Storage Length

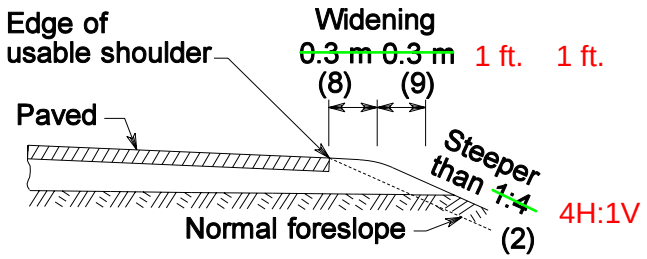


(b) Storage Width

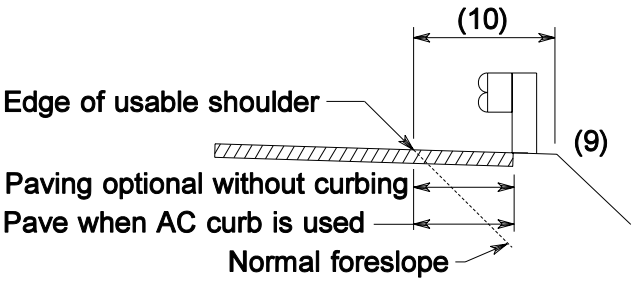
Definition of Ditch or Swale Storage Length and Width
Figure 530-9



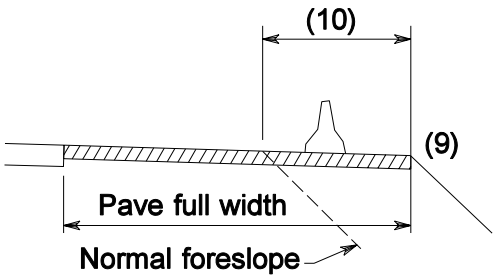
Asphalt Concrete Curb Placement



Shoulder Rounding



Shoulder Widening for Guardrail



Shoulder Widening for Barrier

Notes:

(1) Shoulder cross slopes are normally the same as the cross slopes for adjacent lanes. See 640.04(3) in the text for examples, additional information, and requirements of locations where it may be desirable to have a shoulder cross slope different than the adjacent lane.

(2) Widening and shoulder rounding outside the usable shoulder is required when foreslope is steeper than 4H:1V.

(3) See Chapter 440 for shoulder width.

(4) On divided multilane highways see Figures 640-15a and 15c or additional details and requirements for median shoulders.

(5) See Chapter 1025 for additional requirements for sidewalks.

(6) It is preferred that curb not be used on high speed facilities (posted speed >40 mph).

(7) Paved shoulders are required wherever asphalt concrete curb is placed. Use it only where necessary to control drainage from roadway runoff. See the Standard Plans for additional details and dimensions.

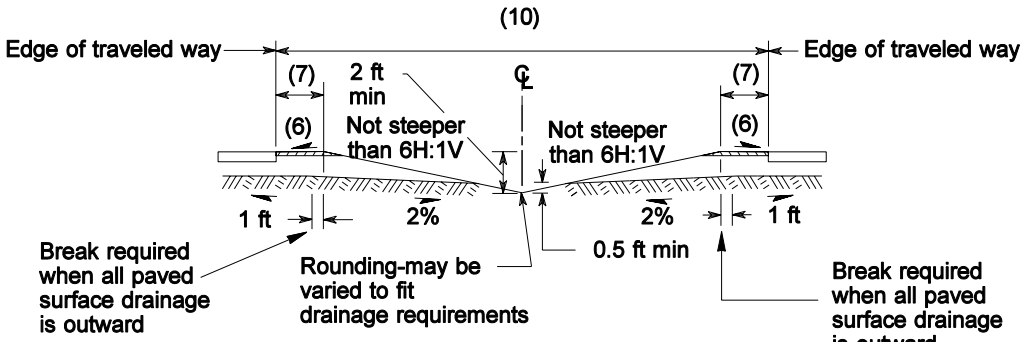
(8) When rounding is required, use it uniformly on all ramps and crossroads, as well as the main roadway.

End rounding on the crossroad just beyond the ramp terminals and at a similar location where only a grade separation is involved.

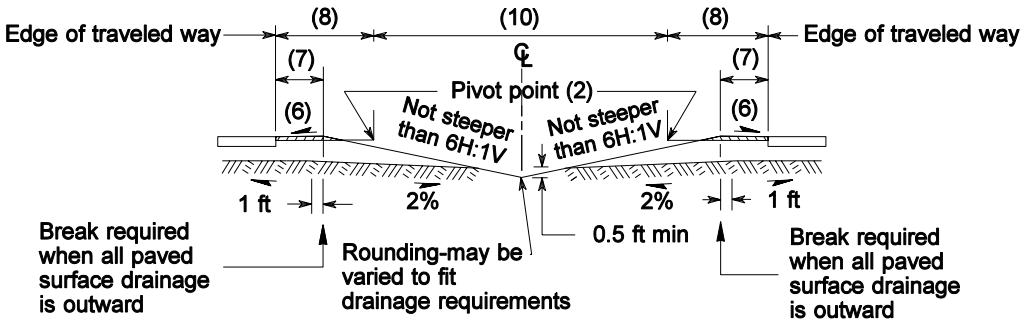
(9) When widening beyond the edge of usable shoulder is required for asphalt concrete curb, barrier, or other purposes, additional widening for shoulder rounding is not required.

(10) See Chapter 710 for required widening for guardrail and concrete barrier.

Shoulder Details
Figure 640-10b



Design C Minimum Nonpaved Median for 4 or More Lanes (2)



Design D Minimum for 4 or More Lanes with Future Lanes in Median

For notes, see Figure 640-15c

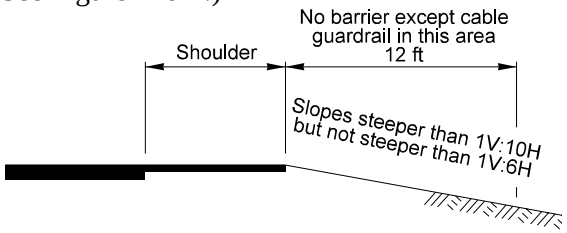
Divided Highway Median Sections

Figure 640-15b

On asphalt concrete pavements (where overlays are anticipated), the Type 1 Alternate guardrail can be used to allow raising of the guardrail without having to adjust the posts.

Weak post W-beam guardrail (Type 20) and thrie beam guardrail (Type 21) are flexible barrier systems that can be used where there is adequate deflection distance. These systems use weak steel posts. The primary purpose of these posts is to position the guardrail vertically and they are designed to bend over when struck. These more flexible systems will result in less damage to the impacting vehicle. Since the weak posts will not result in snagging, blockouts are not necessary.

Keep the slope of the area between the edge of shoulder and the face of the guardrail as flat as possible. The preferred slope is 1V:10H or flatter. Do not place beam guardrail on a fill slope steeper than 1V:6H. On fill slopes between 1V:6H and 1V:10H, beam guardrail must not be placed within 12 ft of the break point. (See Figure 710-4.)



Guardrail Locations on Slopes
Figure 710-4

On the high side of superelevated sections, place beam guardrail at the edge of shoulder.

Generally, 2 ft of shoulder widening behind the barrier is provided from the back of the post to the beginning of a fill slope. If the slope is 1V:2H or flatter, this distance can be measured from the face of the guardrail rather than the back of the post. (See Figure 710-12, Cases 1 ~~and~~ 2.)

On projects where no roadway widening is proposed and the minimum 2 ft shoulder widening behind the barrier is not practical, long post installations are available as shown on Figure 710-12, Cases 3, 4, 5, and 6. When guardrail is to be installed in areas where the roadway is to be widened, the use of Cases 4, 5, or 6 requires a design deviation.

The use of rail washers on beam guardrail is not standard. In areas where heavy snow accumulations are expected to cause the bolts to pull out, specify snow load post and rail washers in the contract documents. (Snow load post washers are used to prevent the bolts from pulling through the posts and snow load rail washers are used to prevent the bolt head from pulling through the rail.) Rail washers are never to be used within the limits of a guardrail terminal except at the end post where they are required for anchorage of the rail.

It is preferred that no curbs be installed in conjunction with beam guardrail. However, if a curb is necessary, the 3 in high curb is preferred. The 4 in high curb can only be used at locations where the 3 in curb will not be adequate. Do not use 6 in high curb in conjunction with beam guardrails. This policy applies to new installations. Existing 6 in high curb is allowed to remain in place. If work requires replacement of an existing 6 in curb, it must be replaced with a 3 in or 4 in curb, whichever is appropriate.

The preferred location of a curb, when used in conjunction with beam guardrail, is behind the face of the beam as shown in the *Standard Plans*.

Beam guardrail is usually galvanized and has a silver color. It can also be provided in a weathering steel that has a brown or rust color. Weathering steel guardrail may be desirable on Scenic Byways or Heritage Tour Routes. (See 710.05.)

(2) Terminals and Anchors

A guardrail anchor is required at the ends of a run of guardrail to develop its tensile strength throughout its length. In addition, when the end of the guardrail is subject to head-on impacts, a crashworthy guardrail terminal is required. (See the *Standard Plans*.)

(a) **Buried Terminals.** The buried terminal (BT) is designed to terminate the guardrail by burying the end in a backslope. The standard BT is the preferred terminal because it eliminates the exposed end of the guardrail.

2000 - PLUS (TL3) or SKT 350 whch are 50 ft long. For lower speed highways (posted speed of 40 mph or less), use the ET 2000 - PLUS (TL2) or SKT-TL2 which are 25 ft long.

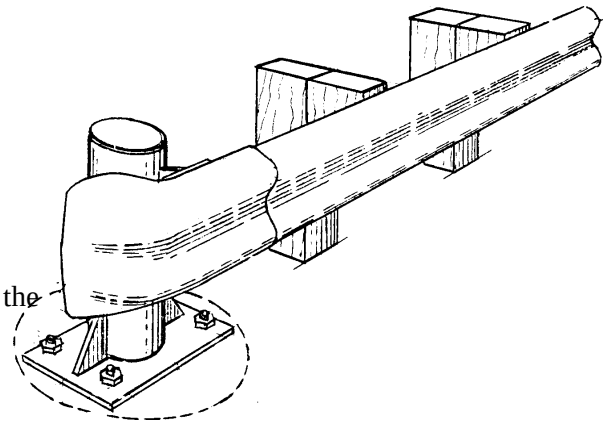
While these terminals do not require an offset at the end, a flare is recommended so that the end piece does not protrude into the shoulder. These terminals may have a 12 in offset of the first post. ~~One meter~~ Four feet of widening is required at the end 2 posts to ensure that the system is properly anchored. For every foot of height of embankment, 3 cubic yards of "Embankment in Place" must be specified.

No snow load rail washers are allowed within the limits of these terminals.

The FHWA has granted approval to use these sole source proprietary terminals without justification on a project by project basis.

(d) **Other Anchor Applications.** On the trailing end of guardrail runs along one-way highways, use the Type 4 anchor to develop the tensile strength of the guardrail. Use the Type 5 anchor with the Weak Post Intersection Design. (See 710.06(4) Cases 12 and 13.) The Type 7 anchor is used to develop tensile strength in the middle of a guardrail run when the guardrail curves and weak posts are used. (See 710.06(4) cases 9, 12, and 13.)

The old Type 3 anchor was primarily used at bridge ends. (See Figure 710-5.) This anchor consisted of a steel pipe mounted vertically in a concrete foundation. Bridge approach guardrail was then mounted on the steel pipe. On one-way highways, these anchors were usually positioned so that neither the anchor nor the bridge rail posed a snagging hazard. In these cases, the anchor may remain in place if a stiffened transition section is provided at the connection to the post. On two-way highways the anchor may present a snagging hazard. In these cases, install a connection from the anchor to the bridge rail if the offset from the bridge rail to the face of the guardrail is 18 in or less. If the offset is greater than 18 in, remove the anchor and install a new transition and connection.



Old Type 3 Anchor
Figure 710-5

Locations where crossroads and driveways cause gaps in the guardrail require special consideration. Elimination of the need for the barrier is the preferred solution. Otherwise, a barrier flare may be required to provide sight distance. If the slope is 1V:2H or flatter and there are no hazards on or at the bottom of the slope, a terminal can be used to end the rail. Place the anchor of this installation as close as possible to the road approach radius PC. If there is a hazard at or near the bottom of the slope that cannot be mitigated, then the Weak Post Intersection Design (see 710.04(4) and the *Standard Plans*) can be used. This system can also be used at locations where a crossroad or road approach is near the end of a bridge and installing a standard bridge approach guardrail placement (guardrail transition and terminal) is not possible.

(3) Transitions and Connections

When there is an abrupt change from one barrier type to a more rigid barrier type, a vehicle hitting the more flexible barrier is likely to be caught in the deflected barrier pocket and directed into the more rigid barrier. This is commonly referred to as pocketing. A transition stiffens the more flexible barrier by decreasing the post spacing, increasing the post size, and using stiffer beam elements to eliminate the possibility of pocketing.

When connecting beam guardrail to a more rigid barrier or a structure, or when a rigid object is within the deflection distance of the barrier, use

two-way traffic and, therefore, a terminal is required on the trailing end. Case 10B is used for one-way traffic when there is no need to extend guardrail past the bridge pier and a Type 4 anchor is used to end the guardrail. Case 10C is used for one-way traffic when the guardrail will extend for a distance past the bridge pier.

Case 11 (A, B, and C) is used at roadside hazards (such as bridge piers) when the guardrail is to be placed within 3 ft of the hazard. Since there is no room for deflection, the rail in front of the hazard must be considered a rigid system and a transition is necessary. The trailing end cases are the same as described for Placement Case 10.

Cases 12 and 13 are called "Weak Post Intersection Designs." They are used where an intersection requires a gap in the guardrail or there is not adequate space for a standard bridge approach installation. These placements are designed to collapse when hit at the nose, and the ribbon strength of the rail brings the vehicle to a stop. A Type 7 anchor is used to develop the ribbon strength. These designs include a Type 5 transition for connection with bridge rail and a Type 5 anchor at the other end of the rail. The Type 5 anchor is not a breakaway anchor and, therefore, can only be used on low speed side roads and driveways.

Since an impacting vehicle will penetrate into the system, it is critical that no fixed objects be located within the clear area shown on the standard plan. The 25 ft along the side road is critical for the operation of this system.

These designs were developed for intersections that are approximately perpendicular. Evaluate installation on skewed intersections on a case-by-case basis. Use the Case 22 placement if it is not feasible to install this design according to the standard plan.

Case 14 shows the approach rail layout for a Service Level 1 bridge rail system. Type 20 guardrail is used on the approach and no transition is required between the Type 20 guardrail and the Service Level 1 bridge rail since they are both weak post systems. A Type 6 transition is used when connecting the Type 20 to a strong post guardrail or a terminal.

Case 15 is used to carry guardrail across a box culvert where there is insufficient depth to install standard posts for more than 17.7 ft. This design uses steel posts anchored to the box culvert to support the rail. Newer designs, Cases 19, 20 and 21, have replaced this design for shorter spans.

Cases 16 and 17 are similar to Cases 1 and 2, except that they flare the rail and terminal as far from the road as possible and reduce the length of need.

Case 18 is used on the trailing end of bridge rail on a one-way roadway. No transition is necessary.

Cases ~~19 and 20~~ 19a and 19b are used where it is not possib to install a post at the 6 ft-3 in spacing. These designs omit one post (which allows a span of 11.5 ft) and use nested W-beam to stiffen the rail. The cases differ by the location of the splice. No cutting of the rail or offsetting of the splices is necessary or desirable.

Case ~~21~~ 20 is similar to Cases ~~19 and 20~~ 19a and 19b, exce it allows for two posts to be omitted which allows a span of ~~17.7~~ 18 ft.

Case 22 is the Strong Post Intersection Design that provides a stiff barrier. This design is only to be used as a last resort at crossroads or road approaches where a barrier is necessary and there isn't a clear area behind the nose or minimum distances for a "Weak Post Intersection Design."

710.07 Cable Barrier

Cable barrier is a flexible barrier system that can be used on a roadside or as a median barrier.

This system consists of three steel cables mounted to steel posts (weak posts). The maximum spacing for the steel posts is 16 ft on tangent sections and curves of 700 ft radius or greater. A deflection of 11.5 ft is anticipated with this post spacing. A smaller spacing is required on radii less than ~~710~~ 700 ft. For tangent sections and large radius curves, the deflection can be reduced to 7 ft by reducing the post spacing to 4 ft.

At each end of the barrier run, the cable is turned down and anchored to concrete blocks. A coil spring and turnbuckle are required on each cable to maintain tension on the system.

L1 = Length of barrier parallel to roadway from adjacent-side hazard to beginning of barrier flare. This is used if a portion of the barrier cannot be flared (such as a bridge rail and the transition)

L2 = Distance from adjacent edge of traveled way to portion of barrier parallel to roadway.

L4 = Length of barrier parallel to roadway from opposite-side hazard to beginning of barrier flare.

L5 = Distance from center line of roadway to portion of barrier parallel to roadway. Note: if the hazard is outside of the Design Clear Zone when measured from the center line, it may only be necessary to provide a crashworthy end treatment for the barrier.

LH1 = Distance from outside edge of traveled way to back side of adjacent-side hazard. Note: if a hazard extends past the Design Clear Zone, the Design Clear Zone can be used as LH1.

LH2 = Distance from center line of roadway to back side of opposite-side hazard. Note: if a hazard extends past the Design Clear Zone, the Design Clear Zone can be used as ~~LH1~~ . LH 2

LR = Runout length (measured parallel to roadway).

X1 = Length of need for barrier to shield an adjacent-side hazard.

X2 = Length of need for barrier to shield an opposite-side hazard.

F = Flare rate value.

Y = Offset distance required at the beginning of the length of need.

Different end treatments require different offsets.

For the SRT 350 and FLEAT 350, use Y = 1.8 ft.

For evaluating existing BCT's, use Y = 1.8 ft.

For the FLEAT TL-2, use Y = 0.8 ft.

No offset is required for the nonflared terminals, or impact attenuator systems. Use Y = 0.

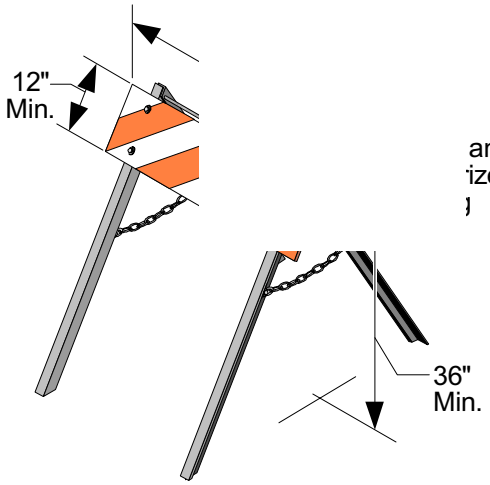
Buried terminal end treatments are used with barrier flares and have no offset. Use Y = 0.

Design Parameters

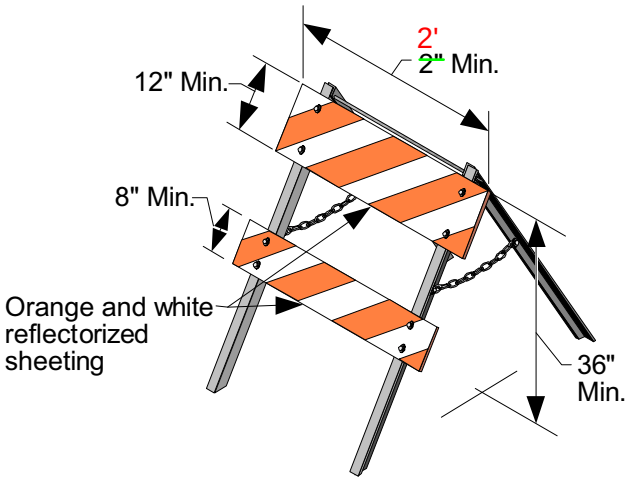
Posted Speed	ADT Over 10,000	ADT 5,000 to 10,000	ADT 1,000 to 4,999	ADT Under 1,000	Rigid Barrier	Unrestrained Barrier	Semirigid Barrier
(mph)	LR (ft)	LR (ft)	LR (ft)	LR (ft)	F	F	F
70	460	395	345	295	20	18	15
60	360	295	260	230	18	16	14
55	310	260	230	195	16	14	12
50	260	215	180	165	14	12	11
45	245	195	165	150	12	11	10
40	215	180	150	130	11	10	9

Barrier Length of Need

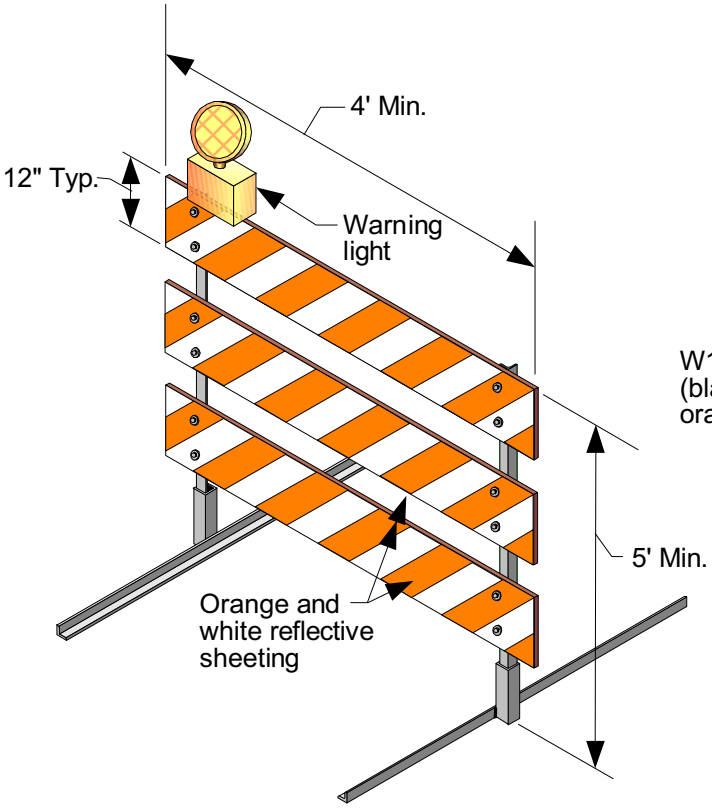
Figure 710-11b



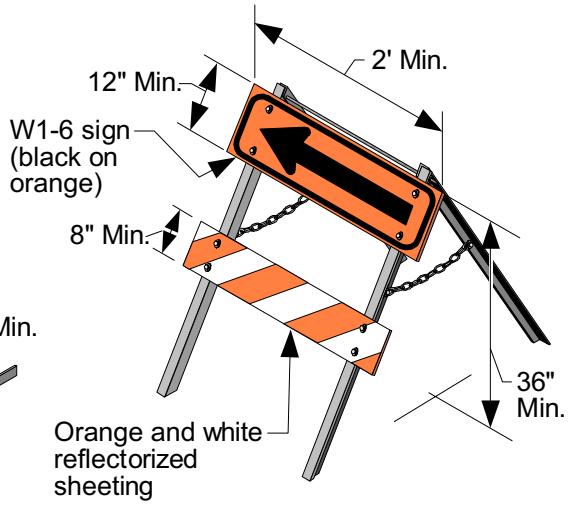
Type I Barricade



Type II Barricade



Type III Barricade



Direction Indicator Barricade

Barricade Types
Figure 810-4

(2) Pavement Marking Materials

Pavement markings are available in various materials. These materials are divided into two categories, paint and plastic. When selecting the pavement marking material to use in a project, consider the initial cost of the material, its service life, location, traffic conditions, the snow and ice removal practices of the particular maintenance area, and the region's ability to maintain the markings. Only consider plastic marking material if the pavement is in good condition and will not require major reconstruction for at least the service life of the material. See Figure 830-1 for the recommended pavement marking materials for different highway types and snow removal practices.

Paint is the most common pavement marking material. It is relatively easy to apply and dries quickly (30 - 90 seconds), after application. This allows the application to be a moving operation which minimizes traffic control costs and delay to the roadway users. Paint is applied on construction contracts with two coats; the first coat is 10 mils thick, followed by a second coat 15 mils thick. The disadvantage of painted pavement markings is its short service life. Only on very low volume roadways subjected to little sanding or snow removal activity will paint provide adequate performance for a year.

Plastic markings have a higher installation cost than paint. They can, however, be a more cost effective measure than paint because of their longer service life. Plastic marking materials currently listed in the Qualified Products List include the following:

- **Thermoplastic.** Thermoplastic material consists of resins and filler materials in solid form at room temperature. The material is heated to a semiliquid, molten state (400 degrees Fahrenheit) and is then applied to the roadway by spray or extrusion methods. This material can be used for both transverse and ~~long~~ longitudinal line applications. Special equipment is required for both the initial application and subsequent maintenance renewal. Sprayed material can be applied at a thickness of 30 mils and dries in 30 to 60 seconds. The service life of material applied in this manner is slightly longer than that of paint. Extruded material is applied at a thickness of 125 mils and has a drying time of 15 minutes. This material can be applied as a flat line or it can be applied with ridges or bumps that enhance wet night visibility These bumps produce a rumble effect similar to rumble strips when a vehicle crosses over the marking. The service life of extruded material is about 3 years. Thermoplastic pavement markings costs about three times more than paint. Failure is usually a result of delamination, rather than wear and abrasion. The material has a different coefficient of expansion than pavement material. Changes in temperature cause the thermoplastic material to crack. This allows the intrusion of moisture between the thermoplastic material and the pavement surface and eventually causes the delamination.
- **Preformed Tape.** Preformed tapes are composed of thermoplastic or other materials that are fabricated under factory conditions. After curing, the material is cut to size and shipped to the work site in rolls or in flat pieces. The material is then applied to the roadway with an adhesive or with heat to activate a preapplied bonding agent. Preformed tapes are available in a thickness of either 60 mils, 90 mils, or 125 mils. Preformed tape will last between 3 and 4 years in a rubber bit snow plow removal area. Preformed tape is about 5 times more expensive than paint. The most durable application of preformed tapes is achieved when the tape is rolled into hot asphalt and the top of the tape is flush with the surface of the pavement. Preformed tapes can have acceptable service lives in ice chisel snow removal areas when the tape is installed in a groove ground into the pavement.
- **Methyl Methacrylate (MMA).** Methyl methacrylate application can be either by spraying or extrusion. Sprayed applications are typically two coats, 45 mils thick. Extruded applications are 90 mils thick for dense asphalt or PCC pavement or 120 mils thick for open graded asphalt pavement.

Light Level and Uniformity Ratio Chart					
Highway Design Class	**Average Maintained Horizontal Light Level** Pedestrian/Area Classification			**Maximum Uniformity Ratio**(1) avg/min	**Maximum Veiling Luminance** Lmax/Lavg
	High (footcandles)	**Medium** (footcandles)	**Low** (footcandles)		
Highways with Full Limited Access Control					
Main Line	0.6	0.6	0.6	4 : 1	0.3 : 1
Ramps	0.6	0.6	0.6	4 : 1	0.3 : 1
Crossroads	0.6	0.6	0.6	3 : 1	0.3 : 1
Ramp Intersections(2)	0.9	0.9	0.9	3 : 1	0.3 : 1
Principal Arterials(3)					
Main Line	1.6	1.2	0.6	3 : 1	0.3 : 1
Intersections	1.6	1.2	0.9	3 : 1	0.3 : 1
Minor Arterials					
Main Line	1.1	0.8	0.6	3 : 1	0.3 : 1
Intersections	~~0.9~~ 1.1	1.0	0.9	3 : 1	0.3 : 1
Collectors					
Main Line	1.1	0.8	0.6	3 : 1	0.3 : 1
Intersections	1.1	1.0	0.9	3 : 1	0.3 : 1
Construction Lanes and Detours	1.0	1.0	0.9	3 : 1	0.3 : 1
Parking Lots	0.8	0.8	0.8	3 : 1	0.3 : 1
Vehicle Inspection Areas	2.0	2.0	2.0	3 : 1	0.3 : 1
Walkways	0.8	0.8	0.8	3 : 1	0.3 : 1
Weigh Scales	0.8	0.8	0.8	3 : 1	0.3 : 1
Bus Loading Zones(4)	2.0	2.0	2.0	NA	0.3 : 1

Notes

(1) The minimum light level is 0.2 fc for any application with an average light levels of 0.6fc. The minimum light levels for all other applications are controlled by the uniformity ratio.

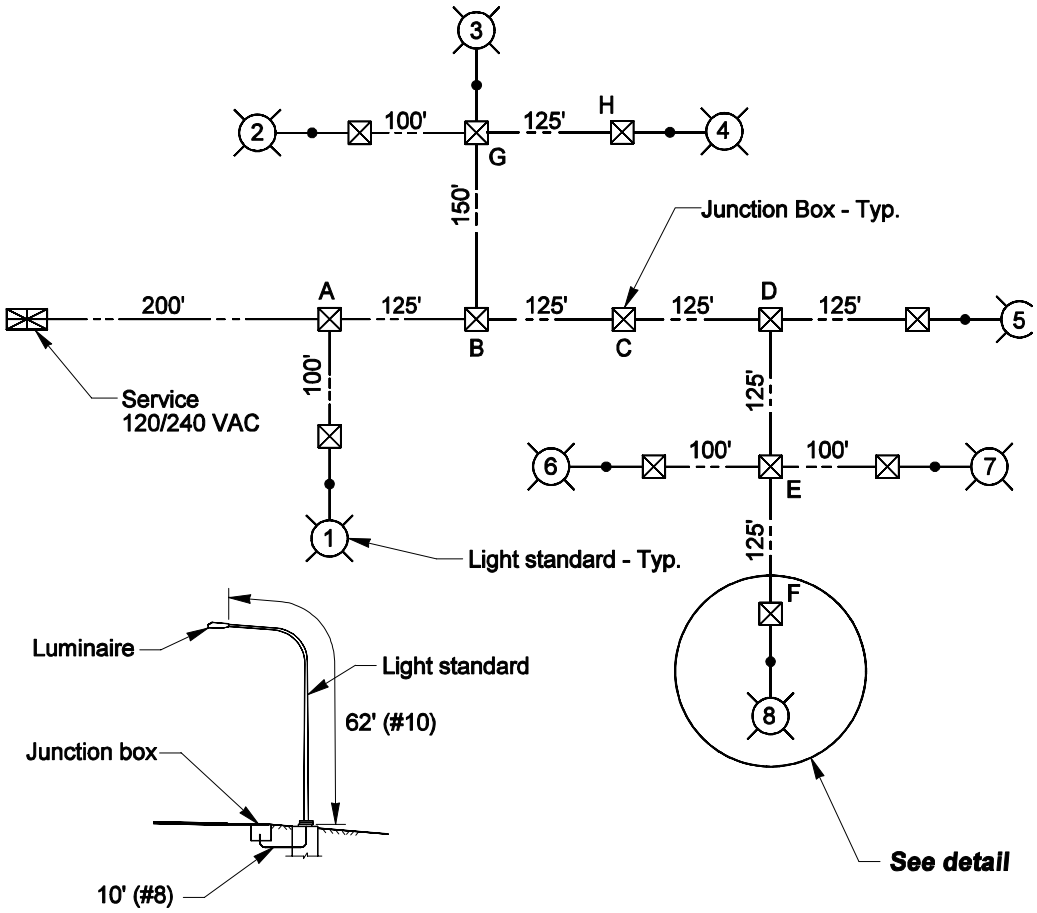
(2) Light level and uniformity ratio apply only when installation of more than one light standard is justified.

(3) Light levels shown also apply to modified and partial limited access control.

(4) Provide the light level at the location where the bus stops for riders.

Light Levels and Uniformity Ratios

Figure 840-6



Light standard detail

Given: 400 watt HPS luminaires 240 VAC, on 50 ft light standards with 16 ft mast arms and 120/240 VAC service.
Unit load= 400 watts / 240 VAC = 1.67 amps.
Unit load x Load Factor (1.2 for HPS) = 1.67 x 1.2 =2 amps per unit.
Allowable Voltage Drop (5%) = 240 VAC x 5% = 12 volts

SOLUTION

Step 1. Calcuate voltage drop to load furthest from service (Luminaire 8)

Circuit Segment	Conductor Size	Load on Segment	A Sum of Loads	L Length (Feet)	R Resistance	2ALR Voltage Drop	Sum of Volt Drop
Service to A	#8	8 2 amps	16	200	0.000809	5.18	5.18
A to B	#8	7 2 amps	14	125	0.000809	2.83	8.01
B to C	#8	4 2 amps	8	125	0.000809	1.62	9.63
C to D	#8	4 2 amps	8	125	0.000809	1.62	11.25
D to E	#8	3 2 amps	6	125	0.000809	1.21	12.46
E to F	#8	1 2 amps	2	135 *	0.000809	0.44	12.90
F to 8	#10	1 2 amps	2	62	0.001290	0.32	13.22

13.22 total voltage drop exceeds the allowed value of 12 volts

*includes 10' (#8) as shown on Light standard detail

Line Loss Calculations

Figure 840-9a

Step 2. Change conductor size to # 6 from service to A and recalculate voltage drop

Circuit Segment	Conductor Size	Load on Segment	A Sum of Loads	L Length (Feet)	R Resistance	2ALR Voltage Drop	Sum of Volt Drop
Service to A	# 6	8 @ 2 amps	16	200	0.000510	3.26	3.26
A to B	# 8	7 @ 2 amps	14	125	0.000809	2.83	6.09
B to C	# 8	4 @ 2 amps	8	125	0.000809	1.62	7.71
C to D	# 8	4 @ 2 amps	8	125	0.000809	1.62	9.33
D to E	# 8	3 @ 2 amps	6	125	0.000809	1.21	10.54
E to F	# 8	1 @ 2 amps	2	135 *	0.000809	0.44	10.98
F to 8	# 10	1 @ 2 amps	2	62	0.001290	0.32	11.30

11.30 total voltage drop is less than the allowable value of 12 volts

Step 3. Calculate voltage drop to Luminaire 4, using conductor sizes from Step 2

Circuit Segment	Conductor Size	Load on Segment	A Sum of Loads	L Length (Feet)	R Resistance	2ALR Voltage Drop	Sum of Volt Drop
Service to A	# 6	8 @ 2 amps	16	200	0.000510	3.26	3.26
A to B	# 8	7 @ 2 amps	14	125	0.000809	2.83	6.09
B to G	# 8	5 @ 2 amps	10	150	0.000809	2.43	8.52
G to H	# 8	1 @ 2 amps	2	135 *	0.000809	0.44	8.96
H to 4	# 10	1 @ 2 amps	2	62	0.001290	0.32	9.28

9.28 total voltage drop is less than the allowable value of 12 volts

Branch Breaker Size = 140% of load (16 amps) = 22.4 amps. Use 30 amp branch breaker.
Circuit Ampacity = The smallest conductor in the circuit is # 8 with an ampacity of 50 amps.
Contactor Size = 30 amps, minimum size that exceeds the circuit load.

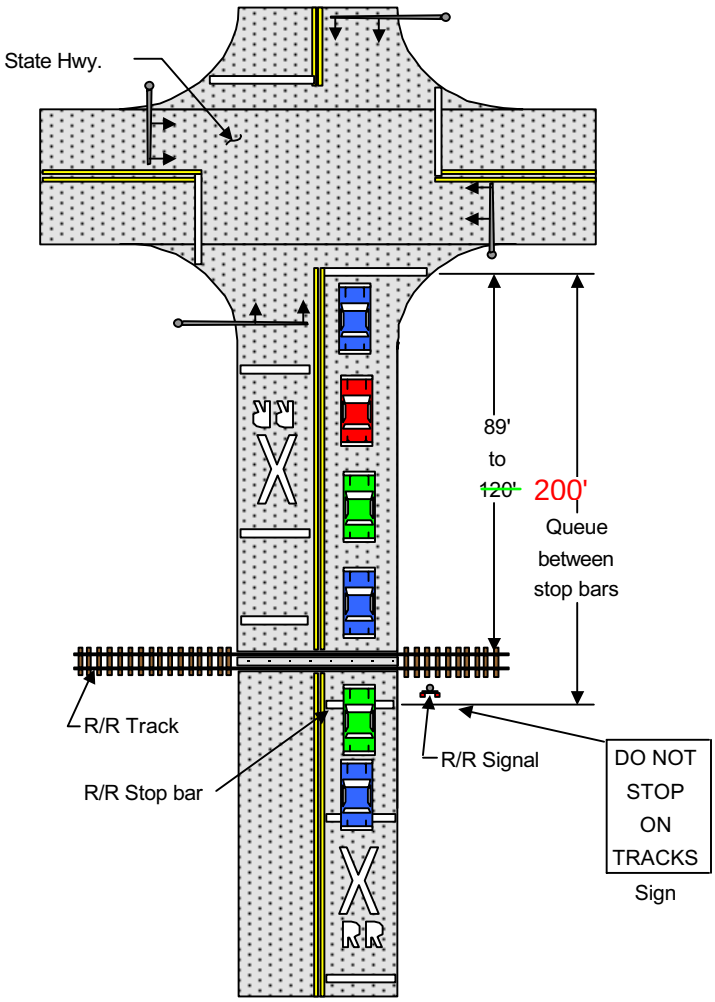
Service Breaker Calculations

Circuit	Load	Factor	A	N	B
Illumination - 240 VAC	16 amps	140%	22.4 amps		22.4 amps
Outlet - 120 VAC	15 amps	125%	18.75 amps		
Heat strip - 120 VAC	1 amp	125%	1.3 amps		
Total sized load			43 amps		22.4 amps

Use 60 amp main breaker (minimum allowed size)

*Steps 2 & 3 above includes 10' (#8) as shown on Light standard detail

Line Loss Calculations
Figure 840-9b



Railroad Crossing more than 88 Ft from Intersection

Intersections With Railroad Crossings

Figure 850-11b

	Design Element	Mini [1]	Urban [2] Compact	Urban Single-Lane	Urban Double-Lane	Rural Single-Lane	Rural Double-Lane
General	Number of Lanes	1	1	1	2	1	2
	Typical max. [3] ADT	12,000	~~15,00~~ 15,000	~~20,00~~ 20,000	40,000	20,000	40,000
	Splitter Island Treatment	Painted, raised if possible	Raised	Raised	Raised	Raised and extended	Raised and extended
	Max. Design[4] Vehicle	SU	SU/BUS	WB-50	WB-50	WB-67	WB-67
Circulating	Inscribed Circle Diameter	45'-80'	80'-100'[5]	100'-130'[6]	150'-180'	115'-130'[6]	180'-200'
	Circulatin Roadway Design Speed	15-18 mph	16-20 mph	20-25 mph	22-28 mph	22-27 mph	25-30 mph
	Circulating Roadway Width	14'-19'	14'-19'	14'-19'	29'-32'	14'-19'	29'-32'
Entry	Max. Entry Design Speed	15 mph	15 mph	20 mph	25 mph	25 mph	30 mph
	Entry Radius	25'-45'	25'[7]-100'	35'[7]-100'	100'-200'	40'-120'[7]	130'-260'
	Entry Lane Widths	14'-16'	14'-16'	14'-16'	25'-28'	14'-16'	25'-28'

(1) Mini roundabouts are not suitable for use on a state route.

(2) Urban compact roundabouts are normally not suitable for use on a state route.

(3) Total ADT entering a 4-leg roundabout with 33% of the volume on the minor roadway. Multiply by 1.2 for 4-leg roundabouts with equal volume on both roadways. Multiply by 0.9 for 3-leg roundabouts.

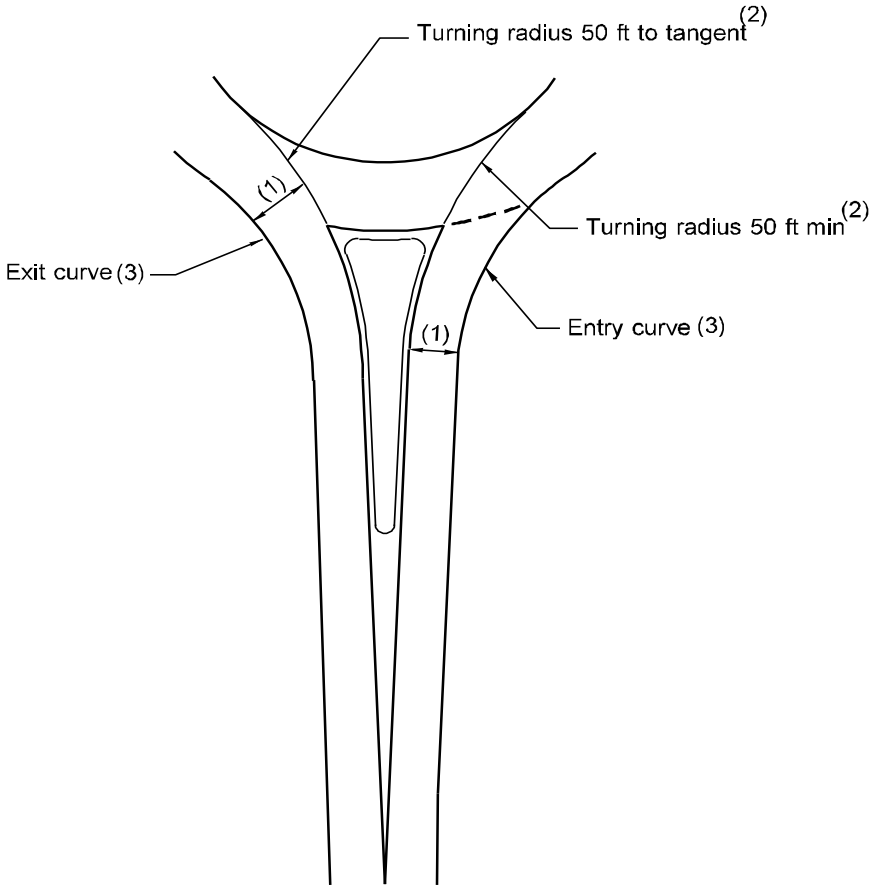
(4) See Chapter 910 for selecting a design vehicle on a state route.

(5) Use 100 ft minimum on state routes.

(6) When roundabout might be expanded to a double-lane roundabout, consider using a double-lane roundabout diameter.

(7) Use 50 ft minimum on state routes.

Roundabout Categories Design Characteristics
Figure 915-6



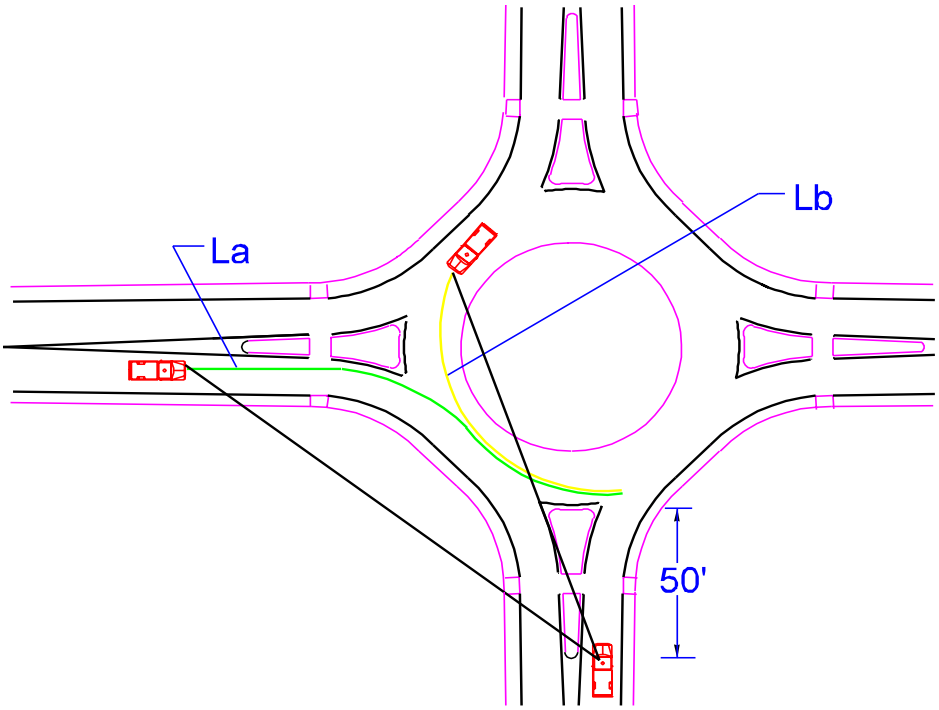
Notes:

(1) Minimum width is 15 ft for 1-lane and 25 ft for 2-lane. Entry and exit widths based on capacity needs (see Figure ~~915-\h 7~~ 915-7) and design vehicle requirements (see Chapter 640 or use templates).

(2) Continuation of splitter island envelope curve tangential to central island.

(3) entry and exit curves tangential to outside edge of circulating roadway.

Entry and Exit
Figure 915-10



Speed (mph)	Gap Acceptance Length (min), L (ft)
15	115
20	150
25	185
30	225
35	260

Where:

La = Sight distance, measured from the yield point, along approach to the left, the minimum gap acceptance length (L) using the average of the entry speed (R_1) and the circulating speed (R_2).

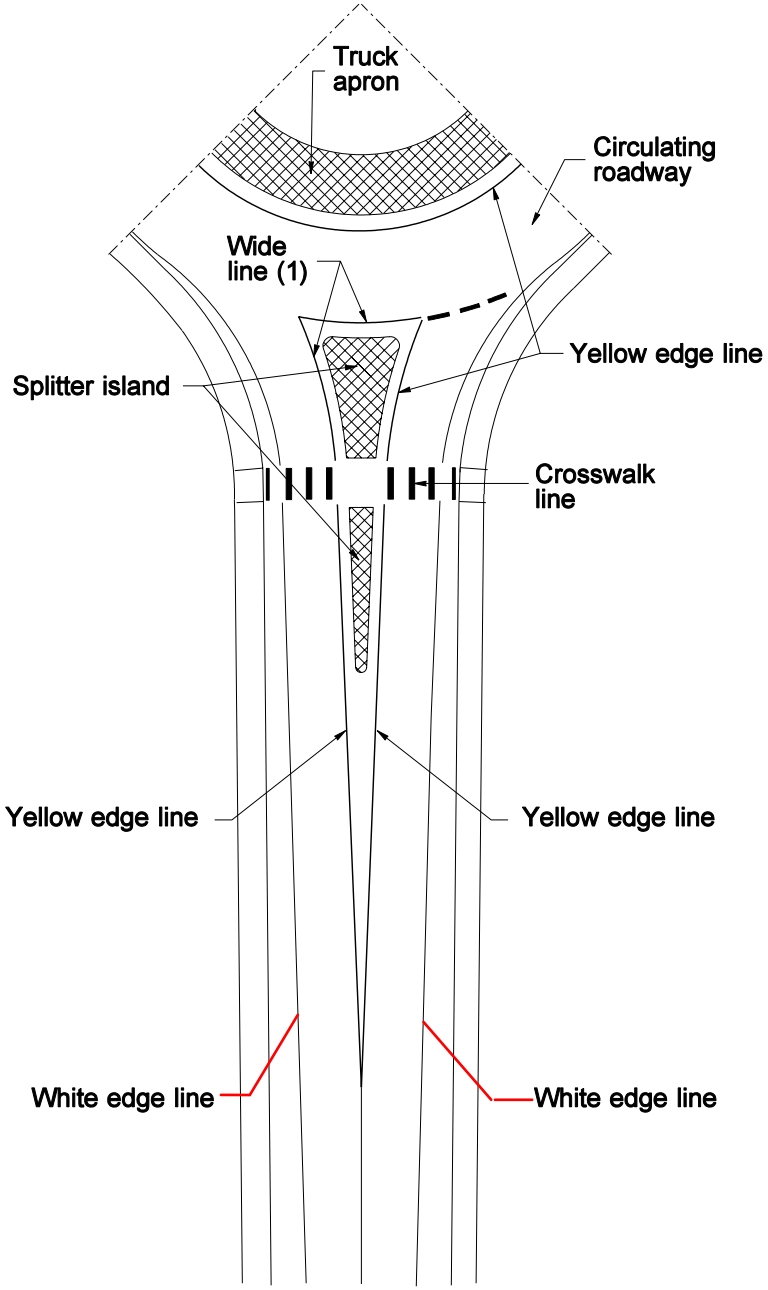
Lb = Sight distance, from the yield point, on circulating roadway, the minimum gap accep tance Length (L) using the left turning vehicle speed (R_4).

Note:

915-8a and 8b

See 915.06(2) and Figures ~~915-\h 8a and \h 8b~~ for information on determining R_1, R_2, and R_4 speeds.

Roundabout Intersection Sight Distance
Figure 915-12



Note:

(1) Extend the wide line to the crosswalk or 25 ft down the exit leg.

Roundabout Pavement Marking
Figure 915-17

joint use approach A single approach that serves more than one property

nonconforming road approach A road approach that does not meet current requirements for location, quantity, spacing, sight distance, or geometric elements

permit The written approval issued by WSDOT authorizing construction, reconstruction, maintenance, or change of category of a road approach

road approach A connection providing private access to or from the state highway system

road approach connection category A category of road approach based on the estimated traffic generated

road approach design template The design geometric standards for a road approach based on the approach usage, types of vehicles that use the approach, and the traffic volume

road approach type The designation of road approaches on limited access facilities based on use of the property served

temporary road approach A road approach for a specific property use, conditioned to be open for a specific purpose and traffic volume for a specific period of time with the right of way to be restored to its original condition upon road approach closure

~~920.4~~ 920.04 Design Considerations

When a highway project impacts existing road approaches, replace all conforming authorized road approaches. Evaluate existing nonconforming authorized road approaches for ways to bring them into conformance. Solutions may include relocation, combining with the road approach of the adjacent property as a joint use approach alteration, closure to the highway system, or addition of access to another public road.

When the evaluation determines that a nonconforming road approach cannot be made conforming and that closure of the road approach would leave the property without a reasonable means of access, issue a nonconforming access connection permit. Document the evaluation that justifies the use of a nonconforming road approach and how it is nonconforming. List these nonconforming road approaches as Design Exceptions (DE).

New road approaches or upgrades to existing road approaches, requested by the property owner, may be included in the project at the expense of the property owner.

Design road approaches at transit facilities in accordance with Chapter 1060.

920.05 Road Approach Connection Category

Category I — minimum connection provides access for up to ten (10) dwelling units of single family residences, duplexes, or other small multifamily complexes; permanent agricultural or forest lands road approaches; the operation, maintenance, and repair of utilities; and road approaches serving other low volume traffic generators with an AWDVTE of 100 or less.

Category II — minor connection provides access to the state highway system for medium volume traffic generators with an AWDVTE of 1500 or less, that are not included in Category I.

Category III — major connection provides access to the state highway system for high volume traffic generators with an AWDVTE exceeding 1500.

Category IV — temporary connection provides access to the state highway system for a limited time.

920.06 Road Approach Design Template

The road approach design template is dependent upon the approach usage, types of vehicles that use the approach, and the traffic volume.

Figure 920-1 lists the road approach design templates, the approach usage, and the largest vehicle that Figures 920-3 through 5 provide for. When a larger design vehicle is required, use the turning path templates in Chapter 910, or from another source, to determine what adjustments to make.

cannot be met, and where a joint use approach or access to another public road meeting or exceeding the minimum corner clearance cannot be obtained or is determined not to be feasible, then the following minimum S values may be used:

Position	Access Allowed	S Min
With Restrictive Medians		
Approaching Intersection	Right In/ Right Out	115 ft
Approaching Intersection	Right In Only	75 ft
Departing Intersection	Right In/ Right Out	230 ft*
Departing Intersection	Right Out Only	100 ft
Without Restrictive Medians		
Approaching Intersection	Full Access	230 ft*
Approaching Intersection	Right In Only	100 ft
Departing Intersection	Full Access	230 ft*
Departing Intersection	Right Out Only	100 ft
*For Highway Access Management Class 5 or for speeds less than 35 mph, 125 ft may be used.		

Minimum Corner Clearance
Figure 920-2

Note: In cases where connections are permitted under the above criteria, the permit issued in compliance with Chapter 468-51 WAC shall contain the following additional conditions;

(i) There shall be no more than one connection per property frontage on the state highway.

(ii) When joint or alternate access meeting or exceeding the minimum corner clearance standards becomes available, the permit holder shall close the permitted connection, unless the permit holder shows to the Department's satisfaction that such closure is not feasible.

(iii) Variance permits are not allowed.

920.09 Drainage Requirements

In a roadway section with a drainage ditch, a culvert pipe is placed under the approach. The approach is graded as shown in Figure 920-5. Be careful that roadway runoff is not a problem in the case of a minus grade to the right of way line.

Design foreslopes not steeper than 6H:1V. Bevel the culvert ends in accordance with Chapter 700.

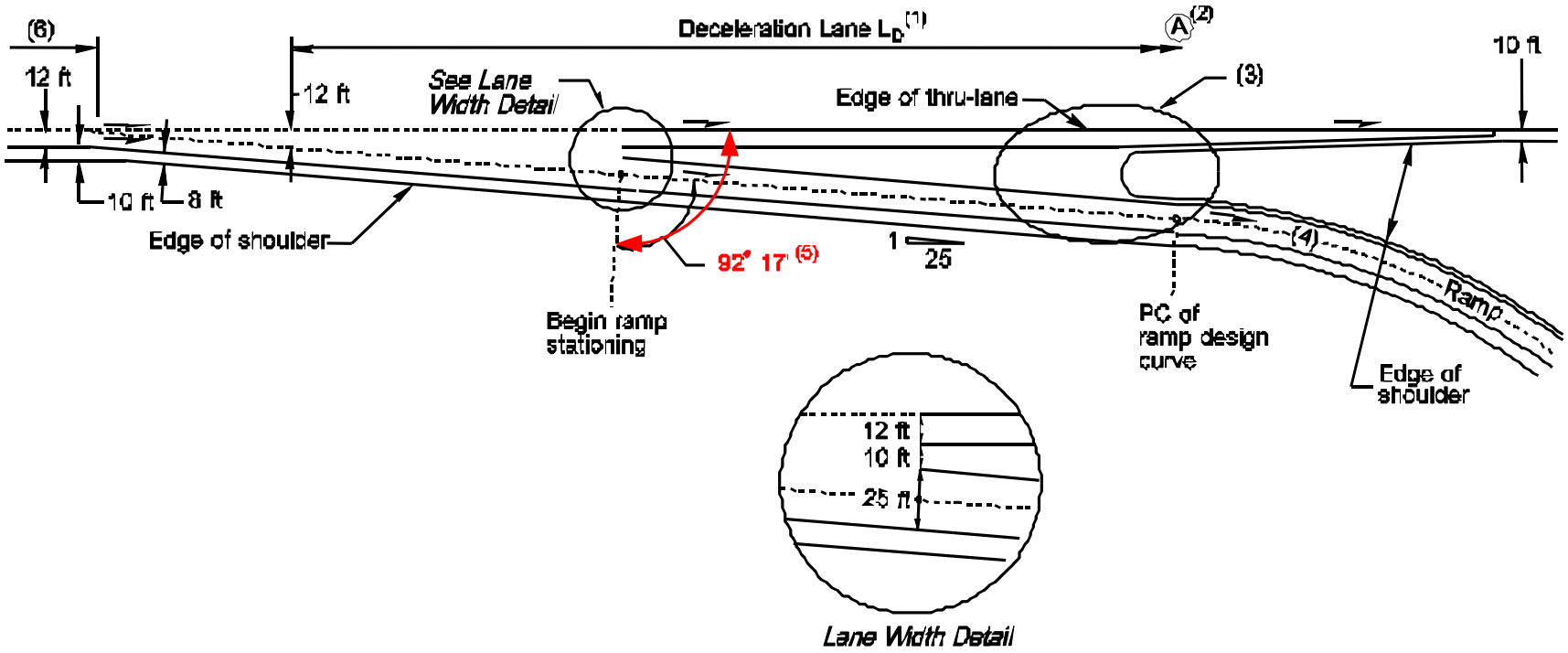
Locate culverts as far from the traveled way as possible. Minimum distances are shown in Figures 920-3 through 5.

A turnpike section (a standard roadway section with a shallow V-shaped paved gutter at the shoulder edge) may be used. Consider continuing the turnpike section throughout the area between the shoulder and the backslope. In the profile controls on Figure 920-5, if the grade from the edge of shoulder to the right of way line is a flat or minus grade and roadway runoff is a consideration, curb may be placed as shown.

Approaches and related areas must be constructed so they do not impair drainage within the right of way or alter the stability of the roadway subgrade.

920.10 Procedures

Verify the validity of all road approaches. Show on a plan or a list the location, template, validity, and justification for all road approaches. Where road approaches are to be included in a project, consider location and function as early as possible, preferably in the preliminary planning stage.



Notes:

(1) See Figure 940-10 for deceleration lane length L_D.

(2) Point (A) is the point controlling the ramp design speed.

(3) See Figure 940-11b for gore details.

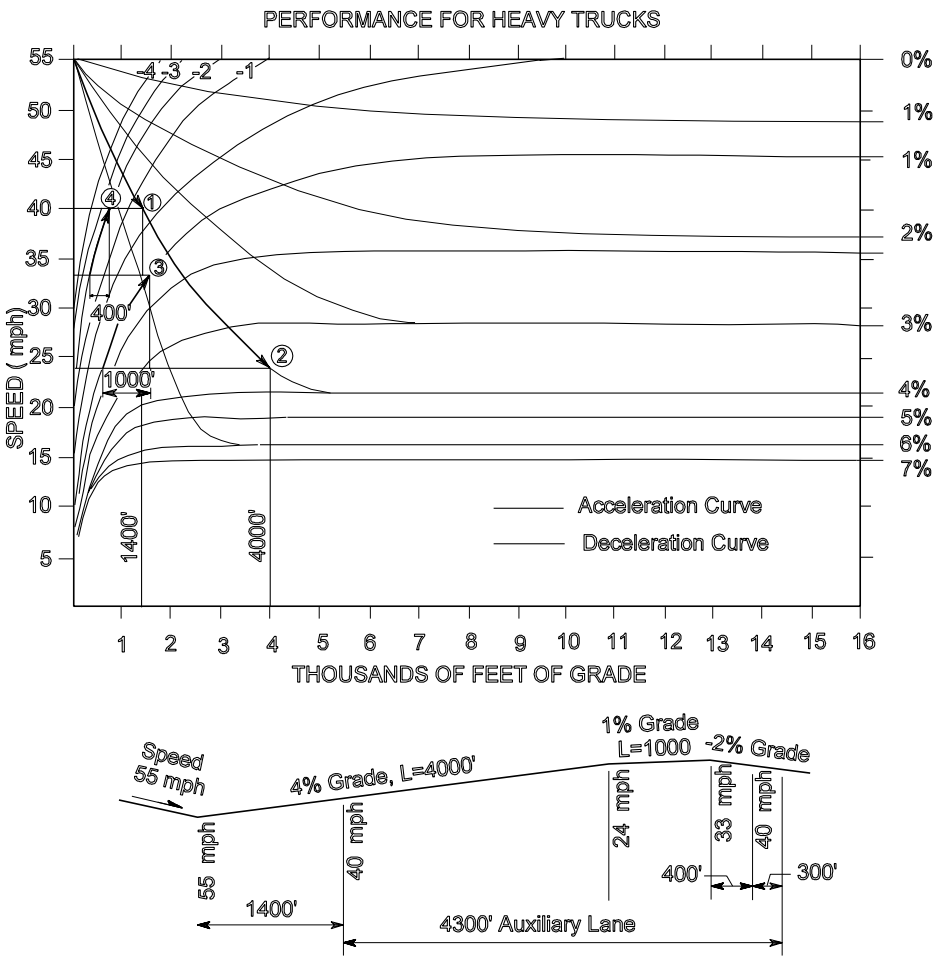
(4) For ramp lane and shoulder widths, see Figure 940-3

(5) Approximate angle to establish ramp alignment.

(6) Lane to be dropped or auxiliary lane with a minimum length of 1,500 ft with a 300 ft taper.

(7) For striping, see the Standard Plans.

Off-Connection (Two Lane, Taper Type)
Figure 940-12d



Given: A 2-lane highway meeting the level of service warrant, with the above profile, and a 55 mph posted speed.

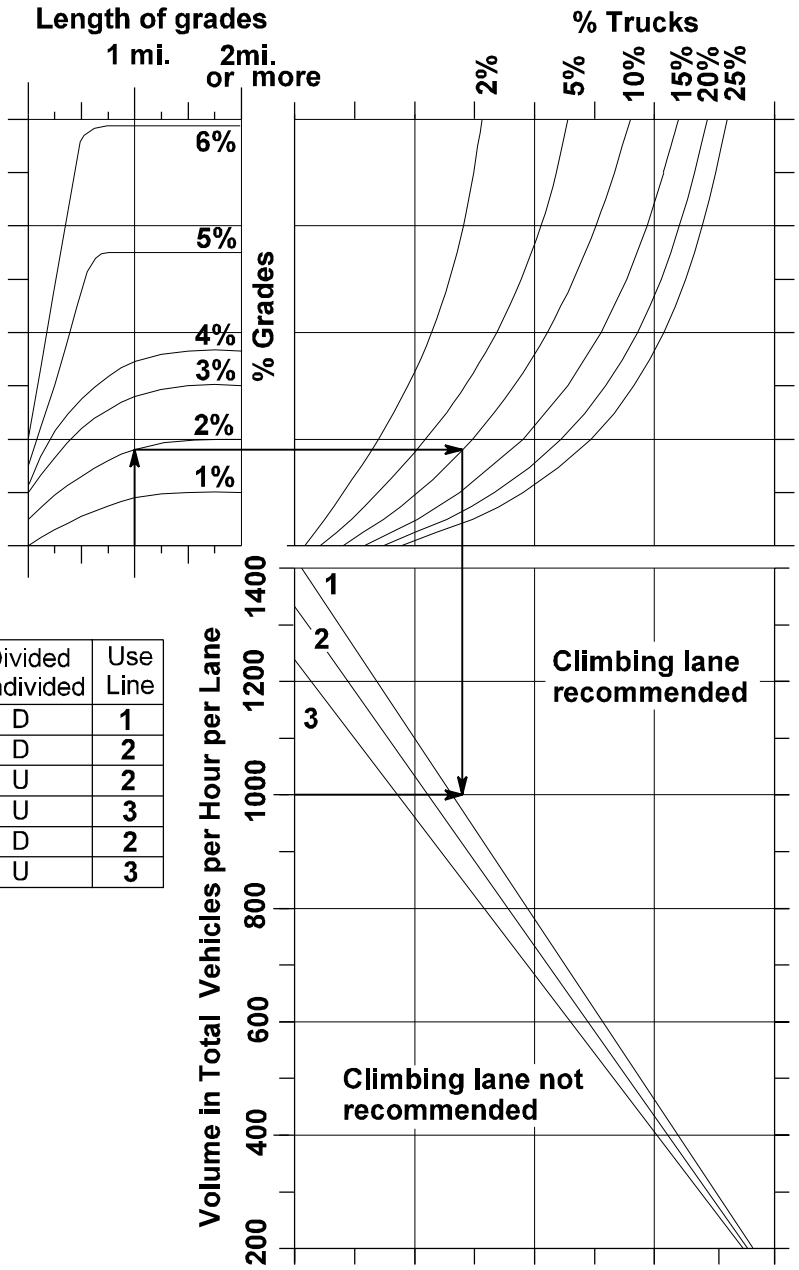
Determine: Is the climbing lane warranted and, if so, how long?

Solution:

1. Follow the 4% grade deceleration curve from a speed of 55 mph to a speed of 40 mph at 1,400 ft. The speed reduction warrant is met and a climbing lane is needed.
2. Continue on the 4% grade deceleration curve to 4,000 ft. Note that the speed at the end of the 4% grade is 25 mph.
3. Follow the 1% grade acceleration curve from a speed of 25 mph for 1,000 ft. Note that the speed at the end of the 1% grade is 34 mph.
4. Follow the -2% grade acceleration curve from a speed of 34 mph to a speed of 40 mph, ending the speed reduction warrant. Note the distance required is 400 ft.
5. The total auxiliary lane length is (4,000-1,400)+~~1,00~~ 1,000 +400+300=4,300 ft. 300 ft is added to the speed reduction warrant for a 2-lane highway, see the text and Figure 1010-4.

Speed Reduction Example

Figure 1010-2b



Lane Width	Lateral Clearance	Divided Undivided	Use Line
12	≥ 6	D	**1**
12	< ≤ 6	D	**2**
12	≥ ≤ 6	U	**2**
12	< 6	U	**3**
11	All	D	**2**
11	All	U	**3**

Example

2% grade for 1 Mile
10% Trucks
12' Lanes
Lateral Clearance
≥ 6'
4 Lane, Divided
DDHV = 2000
From the chart,
climbing lane
is recommended

Level of Service — Multilane
Figure 1010-3

Bike Lane
Figure 1020-2

Shared Roadway
Figure 1020-3

(b) **Bike Lane.** Bike lanes are established along streets in corridors where there is or, in the future, might be significant bicycle demand. (See Figure 1020-2.) Bike lanes delineate the rights of way assigned to bicyclists and motorists and provide for movements that are more predictable by each. An important reason for establishing bike lanes is to better accommodate bicyclists through corridors where insufficient room exists for safe bicycling on existing streets. This can be accomplished by reducing the number of lanes or prohibiting parking in order to delineate bike lanes.

Where street improvements are not possible, improve the bicyclist's environment by providing shoulder sweeping programs and special signal facilities.

When considering the selection of appropriate streets for bike lanes, refer to the location criteria discussed in 1020.04(4).

Do not designate sidewalks as bike lanes.

(c) **Shared Roadway.** Most bicycle travel in Washington occurs on highways and streets without bikeway designations. (See Figure 1020-3.) In most instances, entire street systems are fully adequate for safe and efficient bicycle travel and signing and pavement markings for bicycle use are unnecessary.

The region's ~~Traffic are~~ Traffic Engineer is responsible for determining sections of state highways where bicycle traffic is inappropriate. The State Traffic Engineer, after consultation with the Bicycle Advisory Committee, prohibits bicycling on sections of state highways through the traffic regulation process. Also, see Chapter 1420 "Access l Control Design Policy".

Bicyclists traveling between cities, or on recreational trips, may use many rural highways. In most cases, rural highways are not designated as bike routes because of the limited use and the lack of continuity with other bike routes. However, the development and maintenance of paved shoulders, with or without a standard edge stripe, can significantly improve safety and convenience for bicyclists and motorists along such routes.

Signed Shared Roadway (Designated Bike Route)
Figure 1020-4

(d) **Signed Shared Roadway.** Designate signed shared roadways as bike routes by posting bike route signs. (See Figure 1020-4.) These routes provide continuity to other bicycle facilities and designate preferred routes through high bicycle-demand corridors. As with bike lanes, designating shared roadways as bike routes is an indication to bicyclists that there are particular advantages to using these bike routes as compared with alternative routes. This means that the responsible agencies have taken action to ensure that these routes are suitable as bike routes and are maintained in a manner consistent with the needs of bicyclists. Signing also alerts motor vehicle operators that bicycles are present.

Use the following criteria to aid in determining whether or not to designate and sign a bike route:

- The route offers a higher degree of service than alternative streets.
- It provides for through and direct travel in bicycle-demand corridors.
- It connects discontinuous segments of bikeways.
- Traffic control devices have been adjusted to accommodate bicyclists.
- Street parking is restricted for improved safety where lane width is critical.
- Surface hazards to bicyclists have been corrected.
- Maintenance of the route is to a higher standard than comparable streets, such as more frequent street sweeping and repair.

In general, do not designate sidewalks as bikeways for the following reasons:

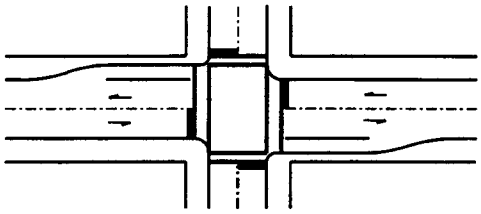
- Sidewalks tend to be used in both directions, despite any signing to the contrary.
- At approaches to intersections, parked cars might impede sight distance of motorists and bicyclists. At driveways, property fences, shrubs, and other obstructions often impair sight distances.
- At intersections, motorists are not looking for bicyclists entering the crosswalk area, particularly when motorists are making a turn.
- Sidewalks are typically designed for pedestrian speeds, and might not be safe for higher-speed use. Conflicts between bicyclists and pedestrians are common, as are conflicts with fixed objects such as parking meters, utility poles, signposts, bus shelters, benches, trees, hydrants, and mailboxes. In addition, bicyclists riding on the curb side of sidewalks might accidentally drop off the sidewalk into the path of motor vehicle traffic.

Only consider a sidewalk as a bike route under special circumstances, such as on long, narrow bridges. Even then, the preferred solution is to widen the roadway to provide space for bicyclists. In residential areas, sidewalk riding is commonly done by Category B and C bicyclists who are not comfortable riding in the street. However, it is inappropriate to sign these facilities as bike routes.

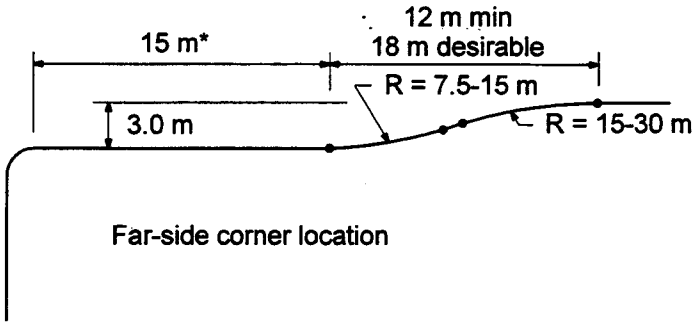
(4) Location Criteria

Factors to consider in determining the location of a bikeway are:

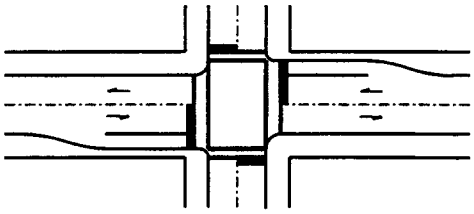
(a) **Potential Use.** Locate bikeways along corridors or a convenient road parallel to the corridor to maximize use. However, to attract commuting bicyclists, the roadway must offer through route conditions.



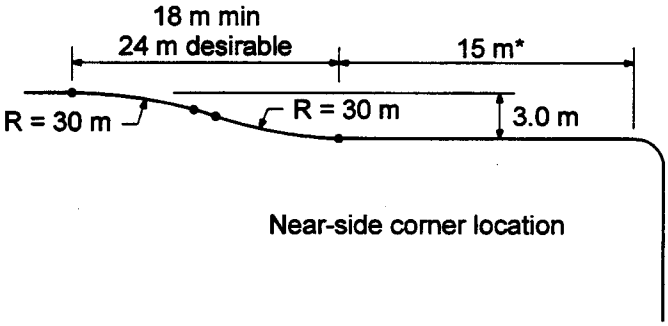
A. Far-side



Far-side corner location

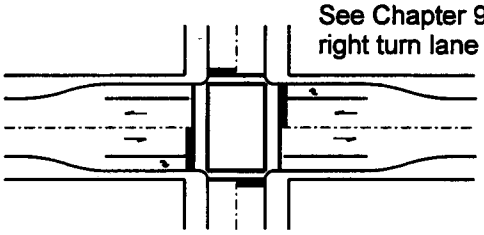


B. Near-side

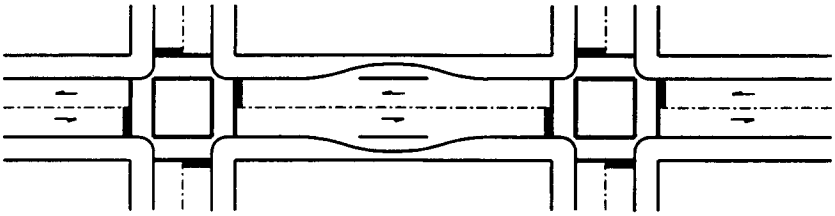


Near-side corner location

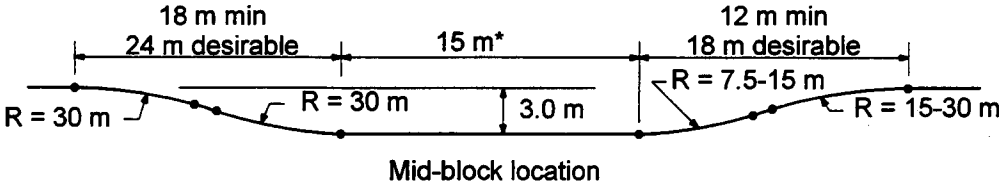
See Chapter 910 for right turn lane design.



C. Near-side right turn lane and far-side bus bays



D. Mid-block bus bays



Mid-block location

* 15 m Bay is for one standard 12 m bus.
Add 13.5 m for each additional standard bus.
Articulated buses require 21 m bays, with
19.5 m for each additional.

Bus Stop Pullouts, Arterial Streets

Figure 1060-6
("Metric)

(c) **Section**

- Show cross sections of the waterway. The extent will be determined by the OSC Hydraulics Branch.

The requirements for waterway profile and cross sections may be less stringent if the Hydraulics Branch has sufficient documentation (FEMA reports, for example) to make a determination. Contact the Hydraulics Branch to verify the extent of the information needed. Coordinate any rechannelization of the waterway with the Hydraulics Branch.

Many waterway crossings require a permit from the U.S. Coast Guard. (See Chapter 240.) Generally, ocean tide influenced waterways and waterways used for commercial navigation require a Coast Guard permit. These structures require the following additional information:

- Names and addresses of the landowners adjacent to the bridge site.
- Quantity of new embankment material within the floodway. This quantity denotes, in cubic ~~meters~~ yards, the material below normal highrr water and the material above normal high water.

Some waterways may qualify for an exemption from Coast Guard permit requirements if certain conditions are met. See the *Bridge Design Manual*. If the waterway crossing appears to satisfy these conditions, then submit a statement explaining why this project is exempt from a Coast Guard permit. Attach this exemption statement to the Environmental Classification Summary prepared for the project and submit it to the OSC Project Development Branch for processing to FHWA.

The region is responsible for coordination with the Bridge and Structures Office, U. S. Army Corps of Engineers, and U. S. Coast Guard for waterways that may qualify for a permit exemption. The Bridge and Structures Office is responsible for coordination with the U.S. Coast Guard for waterways that require a permit.

1110.05 Additional Data for Grade Separations

(1) Highway-Railroad Separation

Supplement bridge site data for structures involving railroads with the following:

(a) **Plan**

- Alignment of all existing and proposed railroad tracks.
- Center-to-center spacing of all tracks.
- Angle, station, and coordinates of all intersections between the highway alignment and each track.
- Location of railroad right of way lines.
- Horizontal curve data. Include coordinates for all circular and spiral curve control points.

(b) **Profile**

- For proposed railroad tracks; profile, vertical curve, and superelevation data for each track.
- For existing railroad tracks, elevations accurate to 0.1 ft taken at 10-ft intervals along the top of the highest rail of each track. Provide elevations to 50 ft beyond the extreme outside limits of the existing or proposed structure. Tabulate elevations in a format acceptable to the Bridge and Structures Office.

(2) Highway-Highway Separation

Supplement bridge site data for structures involving other highways by the following:

(a) **Plan**

- Alignment of all existing and proposed highways, streets, and roads.
- Angle, station, and coordinates of all intersections between all crossing alignments.
- Horizontal curve data. Include coordinates for all curve control points.

(b) **Profile**

- For proposed highways; profile, vertical curve, and superelevation data for each.

(10) Slope Protection at Watercrossings

The WSDOT Headquarters (HQ) Hydraulics Branch determines the slope protection requirements for structures that cross waterways. The type, limits, and quantity of the slope protection are shown on the bridge preliminary plan.

(11) Protective Screening for Highway Structures

The Washington State Patrol classifies the throwing of an object from a highway structure as an assault, not an accident. Therefore, records of these assaults are not contained in the Patrol's accident databases. Contact the region's Maintenance Engineer's office and the Washington State Patrol for the history of reported incidents.

Protective screening might reduce the number of incidents but will not stop a determined individual. Enforcement provides the most effective deterrent.

Installation of protective screening is analyzed on a case-by-case basis at the following locations:

- On existing structures where there is a history of multiple incidents of objects being dropped or thrown and enforcement has not changed the situation.
- On a new structure near a school, a playground, or where frequently used by children not accompanied by adults.
- In urban areas, on a new structure used by pedestrians where surveillance by local law enforcement personnel is not likely.
- On new structures with walkways where experience on similar structures within a 1 mile radius indicates a need.
- On structures over private property that is subject to damage, such as buildings or power stations.

In most cases, the installation of a protective screen on a new structure can be postponed until there are indications of need.

Submit all proposals to install protective screening on structures to the State Design Engineer for approval. Contact the Bridge and Structures Office for approval to attach screening to structures and for specific design and mounting details.

1120.05 Documentation

Include the following items in the design documentation file. See Chapter 330.

- ☐ Structural Capacity Report
- ☐ Evaluation of need and approval for enclosing the area between bridges
- ☐ Correspondence involving the MTMCTEA
- ☐ Justification for eliminating an overlay in the vicinity of a bridge
- ☐ Final Foundation Report
- ☐ Justification and HQ concurrence for omitting approach slabs
- ☐ Analysis of need and approval for protective screening on highway structures
- ☐ Railroad agreement allowing less than 22.5 ft vertical clearance
- ☐ Approval of proposal to mill ~~and existing service~~ an existing surface

intermittent frontage roads are permitted along the outer right of way line.

(b) Bus Stops and Pedestrian Crossings. Bus stops and pedestrian crossings may be permitted as follows:

- In rural areas, bus stops and pedestrian crossings shall be subject to the same restrictions as in 1420.03(5)(b).
- In urban areas, bus stops for both commercial carriers and school buses may be permitted without restriction.

(c) Mailboxes. Mailboxes may be located adjacent to or opposite all authorized approaches as follows:

- Mailboxes on a four-lane highway shall be located only on the side of the highway on which the approach is provided.
- Mailboxes on a two-lane highway shall all be located on that side of the highway which is on the right in the direction of the mail delivery.

Where mailboxes are allowed, a mailbox turnout should be provided to allow mail delivery vehicles to stop clear of the through traffic lanes. See Chapter ~~730~~ 700 for additional information concerning mailbox locations and turnouts.

(6) Nonmotorized Traffic

Pedestrian and bicycle traffic is permitted, consistent with Rules of the Road, on highways with modified access control, except where unusual safety considerations warrant prohibition. Information pertaining to such prohibitions may be obtained from the Traffic Engineering Branch of the Operations and Maintenance Office.

1420.05 ACCESS APPROACHES

(1) General

Access approaches may be permitted on limited access highways consistent with the criteria outlined in 1420.02, 1420.03, 1420.04, and 1420.06.

For additional information pertaining to approaches, refer to Chapters 920 and 1410, and the *Plans Preparation Manual*, M 22-31.

(2) Definitions

The widths for the following approach types should be negotiated, and only the negotiated width shall be shown on the plan.

(a) Type A Approach. Type A Approach is an Off and On approach in legal manner, not to exceed 30 feet in width, for the sole purpose of serving a single family residence. It may be reserved by the abutting owner for specified use at a point satisfactory to the state at or between designated highway stations.

(b) Type B Approach. Type B Approach is an Off and On approach in legal manner, not to exceed 50 feet in width, for use necessary to the normal operation of a farm, but not for retail marketing. It may be reserved by the abutting owner for specified use at a point satisfactory to the state at or between designated highway stations.

(c) Type C Approach. Type C Approach is an Off and On approach in legal manner, for special purpose and width to be agreed upon. It may be specified at a point satisfactory to the state at or between designated highway stations.

(d) Type D Approach. Type D Approach is an Off and On approach in a legal manner not to exceed 50 feet in width for use necessary to the normal operation of a commercial establishment. It may be specified at a point satisfactory to the state at or between designated highway stations.

(e) Type E Approach. Type E Approach is a separated Off and On approach in a legal manner, with each opening not exceeding 30 feet in width, for use necessary to the normal operation of a commercial establishment. It may be specified at a point satisfactory to the state at or between designated highway stations.

1420.06 APPROACHES BETWEEN LIMITED ACCESS HIGHWAYS AND ADJACENT RAILROADS

(1) General

A highway and railroad are considered adjacent when they have a common right of way border with no other property separating them. This applies only to railroads on operating right of way and not to adjacent railroad property which is not directly used for railroad operation.

(2) Warrants

It is in the public interest to provide access to the railroad right of way from limited access highways for maintenance of the railroad and utilities located on the railroad right of way when other access is not feasible. This applies both to new highways and to existing highways where access control is obtained.

Direct access is permitted when local roads are infrequent or there are few highway-railroad crossings from which trail-type access for maintenance purposes is feasible, and when unique topography or other unusual conditions justify its use.

Direct access from the highway is considered unnecessary and is not permitted when:

- There are local roads adjacent to or crossing the railroad.

Project Type	Support Team	Policy Point 1	2	3	4	5	6	7	8	Accept-ance *	Approval *
For Partial and Modified Access Control Freeways (See Chapter 1420.)										OSC	OSC
New intersection or access point, partial access control	R	S	S	S	S	S	S	S	S	✓	✓
New intersection or access point, modified access control	R			S	S	(5)	S			✓	✓
Change intersection to interchange or over/undercrossing (6)	R	S		S	S	S	S			✓••	✓••
Modify interchange with effects	R			S	S		S		(7)	✓	✓
Modify intersection with effects	R			S	S					✓	✓

1425.04(3) 1425.04(3)

* See ~~1425(3)~~ regarding acceptance and ~~1425(4)~~ regarding approval.

•• See Figure 1425-2 for exceptions

FHWA Federal Highway Administration.

OSC Olympia Service Center, Design Office. The Access and Hearings Engineer coordinates acceptance and approval.

B Brief (policy point) report item required.

✓ OSC acceptance and approval.

F On the Interstate system, a (policy point) report item required by FHWA.

L For Interstate, FHWA acceptance or approval at the local division level, which can be expected to take from 1 to 4 months, or longer, depending on the complexity of the project and its environmental processes.

N For Interstate, FHWA acceptance at the national level, which can be expected to take from 3 to 12 months, or longer, depending on the complexity of the project and its environmental processes.

R Recommended.

S On a non-Interstate route, a (policy point) report item required by the state.

Notes:

(1) A transportation management area is a county with a population greater than 200,000. In Washington they are Clark, King, Pierce, Snohomish, Spokane, and Yakima Counties.

(2) "Modification" includes changes in interchange configuration even though the number of access points does not change. Changing from a cloverleaf to a directional interchange is an example of a "modification." However, for non-Interstate, if the modification does not add new lanes and can be shown to have no adverse impacts, and the spacing and geometric control criteria requirements will be met, omit the request and document justification to the design file.

(3) Modifications that might adversely affect the level of service of the through lanes. Examples: doubling lanes for an on-ramp with double entry to the freeway; adding a loop ramp to an existing diamond interchange, replacing a diamond ramp with a loop ramp.

(4) Unless it is a condition of the original approval.

(5) Sketch only.

(6) Changing an intersection to an over/undercrossing if all conditions on Figure 1425-2 are met.

(7) Only if data is not consistent between the decision report and the environmental analyses.

Access Point Decision Report Content and Review Levels

Figure 1425-1b

1450.01 General

Proper monumentation is important in referencing a highway's alignment that is used to define its right of way and the department can contribute to the body of public records and minimize duplication of survey work by establishing and recording monuments that are tied to a state plane and to a standard vertical datum. In addition, the department is required by law to perpetuate existing recorded monuments. (See RCW 58.09.) Consequently, the department shall provide monuments for realignments and new highway alignments and shall perpetuate existing monuments impacted by a project.

Both the Department of Natural Resources (DNR) and the Geographic Services Branch maintain records of surveys performed and survey monuments established. New monuments are to be reported to both ~~operations~~. organizations

Existing monuments are not to be disturbed without first obtaining the DNR permits required by state law. DNR allows the temporary covering of a string of monuments under a single permit. State law requires replacement of land boundary monuments after temporary removal according to permit procedures. WSDOT control and alignment monuments may be removed without replacement if approved by the Geographic Services Branch. (Notify DNR.)

Other requirements pertaining to specific monuments are discussed below.

Figure 1450-1 summarizes the documentation requirements for new and existing monuments.

The region is responsible for obtaining all required permits before any existing monument is disturbed and for the research to locate existing monuments as required by WAC 332-120-030 as follows:

> *(2) Any person, corporation, association, department, or subdivision of the state, county or municipality responsible for an activity that may cause a survey monument to be removed or destroyed shall be responsible for ensuring that the original survey point is perpetuated. It shall be the responsibility of the governmental agency or others performing construction work or other activity (including road or street resurfacing projects) to adequately search the records and the physical area of the proposed construction work or other activity for the purpose of locating and referencing any known or existing survey monuments.*

1450.02 References

"Engineers and Land Surveyors," RCW 18.43

"Surveys — Recording," RCW 58.09

"State Agency for Surveys and Maps — Fees," RCW 58.24

"Survey Monuments--Removal or Destruction," WAC 332-120

"Minimum Standards for Land Boundary Surveys and Geodetic Control Surveys and Guidelines for the Preparation of Land Descriptions," WAC 332-130

"*Manual of Instructions for the Survey of the Public Lands of the United States* 1973 BLM, U.S. Department of Interior"

1450.03 Definitions

monument, as defined for this chapter, is any physical object or structure which marks or references a survey point. This includes a point of curvature (P.C.), a point of tangency (P.T.), a property corner, a section corner, a General Land Office (GLO) survey point, a Bureau of Land

if required by the development of the surrounding area. This fence may be used along a bike path or hiking trail to separate it from an adjacent roadway.

(d) **Type 6.** A lower fence used instead of Type 1 where it is deemed important not to obstruct the view toward or from areas adjacent to the highway. This fence is not to be used within the Design Clear Zone because the top rail of the fence is considered a hazard. (See Chapter 700.)

Coated galvanized chain link fence is available in various colors and may be considered in areas where aesthetic considerations are important. Coated ungalvanized chain link fence is not recommended.

(2) Wire Fencing

The Standard Plans and Specifications contain details for the two approved types of wire fence. The recommended uses for each type of fence are as follows:

(a) **Type 1.** This fence is used in urban and suburban areas where improvements along the right of way are infrequent and future development is not anticipated. It may also be used adjacent to livestock grazing areas. The lower portion of this fence is wire mesh and provides a barrier to children and small animals.

(b) **Type 2.** This fence is used in farming areas to limit highway crossings by farm vehicles to designated approaches: in irrigation districts to prevent ditch riders, maintenance personnel, and farmers from making unauthorized highway crossings; and where new alignment crosses parcels previously enclosed by barbed wire.

(3) Other Considerations

Extremely tall fences (7 to 10 ft high) may be used in areas where there are exceptional hazards such as large concentrations of deer or elk. See the region's Environmental Office and the *Roadside Manual* concerning wildlife management.

Metal fencing can interfere with airport traffic control radar. When locating fencing in the vicinity of an airport, contact the Federal Aviation Administration to determine if metal fence will create radar interference at the airport. If so, use nonmetallic fencing.

Do not straddle or obstruct surveying monuments.

1460.05 Gates

Keep the number of fence gates along limited access highways to a minimum. On limited access highways, all new gates must be approved as described Chapter 1425, "Access Point Decision Report."

Usually such gates are necessary only to allow highway maintenance personnel and operating equipment to reach the freeway border areas without using the through-traffic roadway. Gates may be needed to provide access to utility supports, manholes, and the like, located within the right of way.

Use gates of the same type as the particular fence, and provide locks to deter unauthorized use.

In highly developed and landscaped areas where maintenance equipment is parked outside the fence, provide the double gate indicated in the Standard Plans.

Where continuous fencing is not provided on limited access highways, Type C approaches are normally gated and locked, with a short section of fence on both sides of the gate.

1460.06 Procedure

Fencing is included in the access report, in accordance with Chapter 1430, and the PS&E, in accordance with the *Plans Preparation Manual*.